

### DESCRIPTION

The EVM38222-R-01A Evaluation Board is designed to demonstrate the capabilities of MPS' MPM38222. The MPM38222 is a Dual Channels DC-DC Module. The module includes monolithic step-down switch mode converter with built-in internal power MOSFETs and inductors. It's designed to simplify power system design and provide ease of use.

The MPM38222 operates from a 2.7V-to-6V input, generates an output voltage as low as 0.608V, and has a 45µA quiescent current that makes it ideal for powering portable equipment that runs on a single cell lithium-ion (Li+) battery.

### ELECTRICAL SPECIFICATION

Parameter	Symbol	Value	Units
Input Voltage	$V_{IN}$	2.7 – 6	V
Output Voltage	$V_{OUT1}/V_{OUT2}$	1.8/1.2	V
Output Current	$I_{OUT1}/I_{OUT2}$	2/2	A

### FEATURES

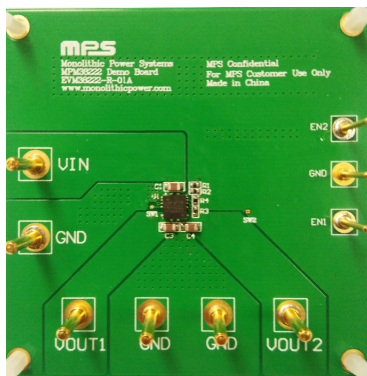
- Dual 2A-Output Current
- >93% Peak Efficiency
- >80% Light-Load Efficiency
- Ultra Low IQ: 45µA
- 80mΩ and 35mΩ Internal Power MOSFET
- Wide 2.7V to 6V Operating Input Range
- Default 1MHz Switching Frequency
- 180° Phase-Shifted Operation
- 4mmx4mmx1.6mm QFN14 package
- 100% Duty Cycle Operation
- Cycle-by-Cycle Over-Current Protection
- Short Circuit Protection with Hiccup Mode
- Thermal Shutdown

### APPLICATIONS

- Small/Handhold Devices
- DVD Drivers
- Portable Instruments
- Smart Phones and Feature Phones
- Battery-Powered Devices

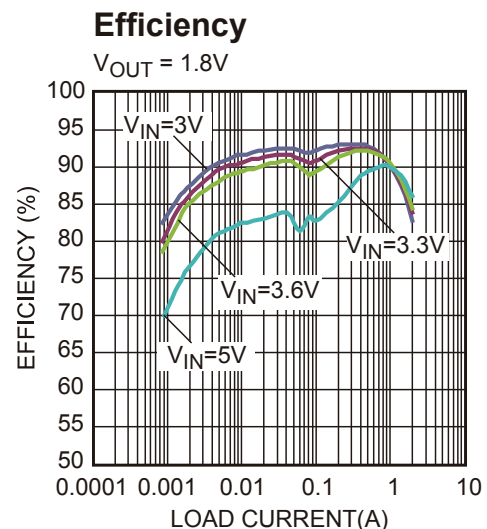
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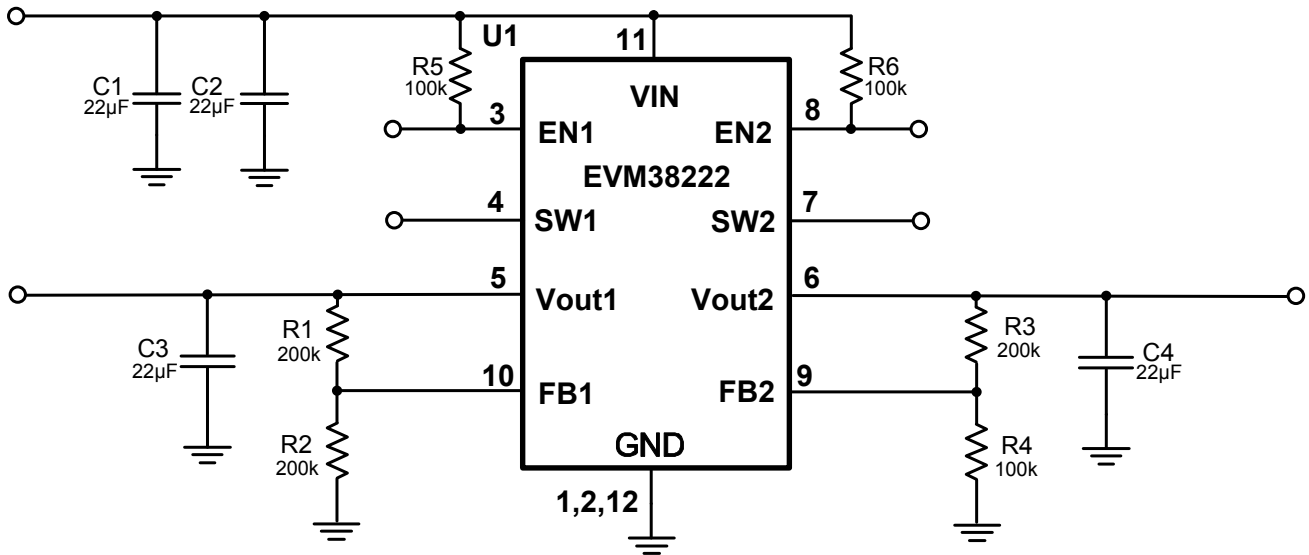
### EVM38222-R-01A EVALUATION BOARD



(L x W x H) 6.5cm x 6.5cm x 1.6cm

Board Number	MPS IC Number
EVM38222-R-01A	MPM38222



**EVALUATION BOARD SCHEMATIC**

**EVM38222-R-01A BILL OF MATERIALS**

Qty	Ref	Value	Description	Package	Manufacturer	Part Number
3	R1, R3, R2	200kΩ	Film Res,1%	0603	ROYAL	RL0603FR-07200KL
3	R4, R5, R6	100kΩ	Film Res,1%	0603	ROYAL	RL0603FR-07100KL
4	C1, C2, C3, C4	22µF	Ceramic Cap,10V, X5R	0805	muRata	GRM21BR61A226ME51L
1	U1	MPM38222	Dual Channel Step Down Switcher	QFN-14 4.0x4.0mm	MPS	MPM38222GR

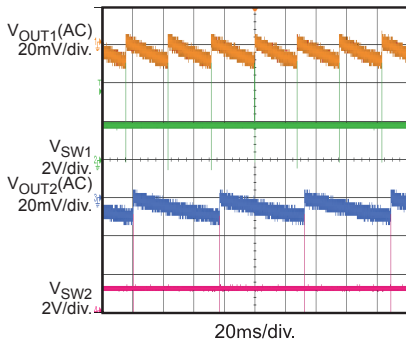
## EVB TEST RESULTS

Performance waveforms are tested on the evaluation board.

$V_{IN} = 5V$ ,  $V_{OUT1} = 1.8V$ ,  $V_{OUT2} = 1.2V$ ,  $C_{OUT1} = C_{OUT2} = 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

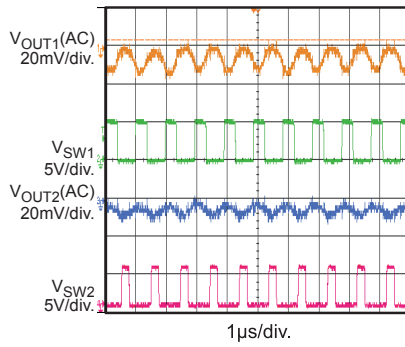
### Output Ripple

$I_{OUT1} = I_{OUT2} = 0A$



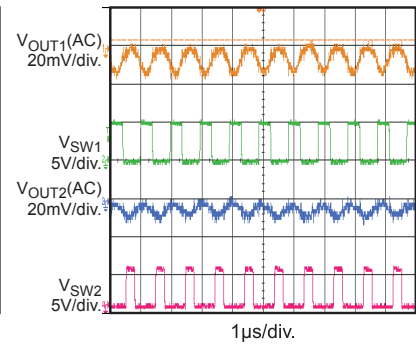
### Output Ripple

$I_{OUT1} = I_{OUT2} = 1A$



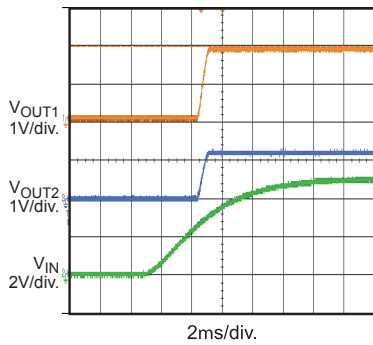
### Output Ripple

$I_{OUT1} = I_{OUT2} = 2A$



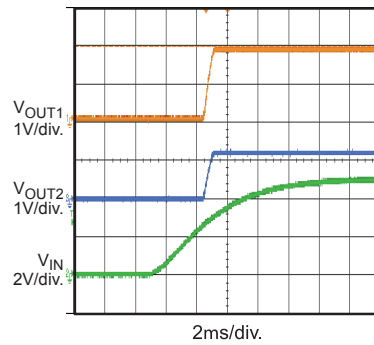
### $V_{IN}$ Power Up without Load

$I_{OUT1} = I_{OUT2} = 0A$



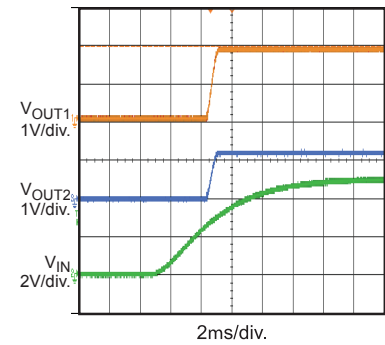
### $V_{IN}$ Power Up with 1A Load

$I_{OUT1} = I_{OUT2} = 1A$



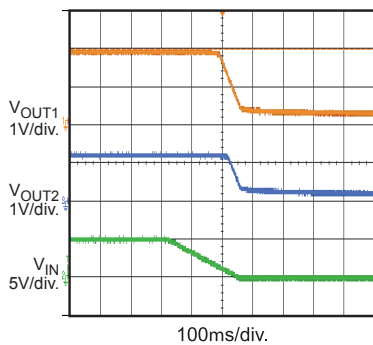
### $V_{IN}$ Power Up with 2A Load

$I_{OUT1} = I_{OUT2} = 2A$



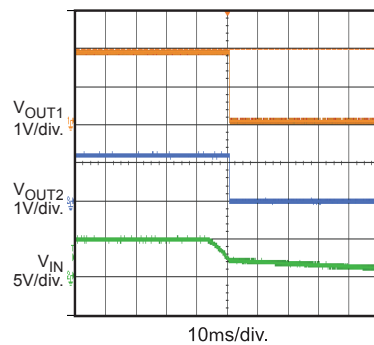
### $V_{IN}$ Power Down without Load

$I_{OUT1} = I_{OUT2} = 0A$



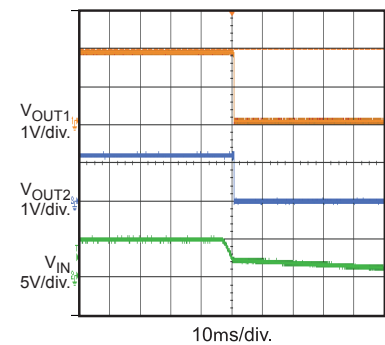
### $V_{IN}$ Power Down with 1A Load

$I_{OUT1} = I_{OUT2} = 1A$



### $V_{IN}$ Power Down with 2A Load

$I_{OUT1} = I_{OUT2} = 2A$



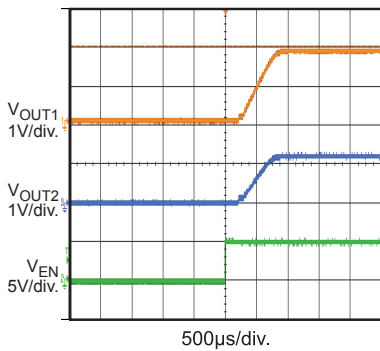
**EVB TEST RESULTS** (continued)

Performance waveforms are tested on the evaluation board.

$V_{IN} = 5V$ ,  $V_{OUT1} = 1.8V$ ,  $V_{OUT2} = 1.2V$ ,  $C_{OUT1} = C_{OUT2} = 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

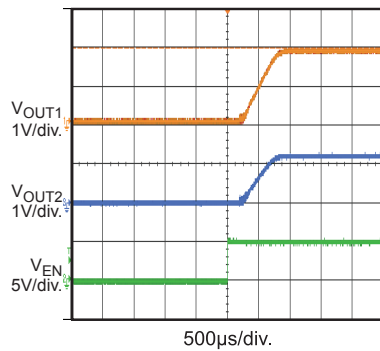
**EN On without Load**

$I_{OUT1} = I_{OUT2} = 0A$



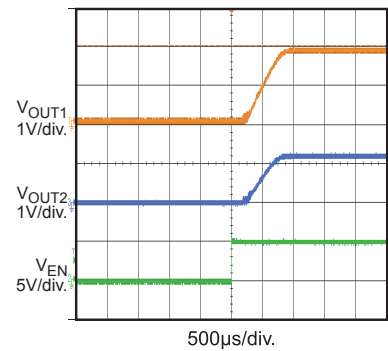
**EN On with 1A Load**

$I_{OUT1} = I_{OUT2} = 1A$



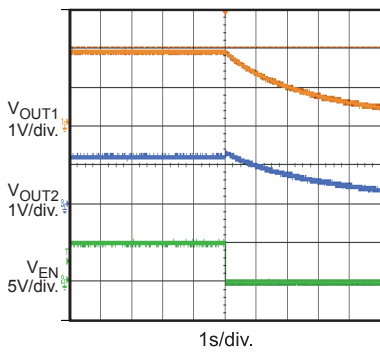
**EN On with 2A Load**

$I_{OUT1} = I_{OUT2} = 2A$



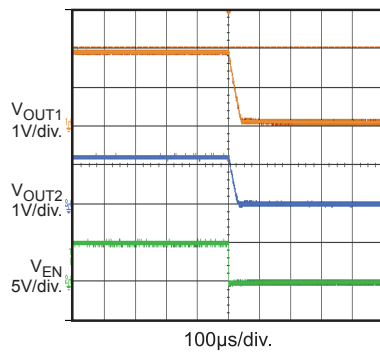
**EN Down without Load**

$I_{OUT1} = I_{OUT2} = 0A$



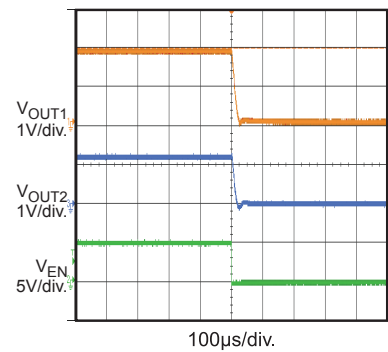
**EN Down with 1A Load**

$I_{OUT1} = I_{OUT2} = 1A$



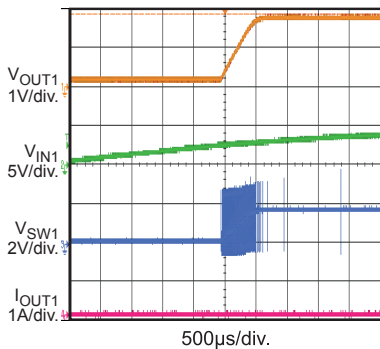
**EN Down with 2A Load**

$I_{OUT1} = I_{OUT2} = 2A$



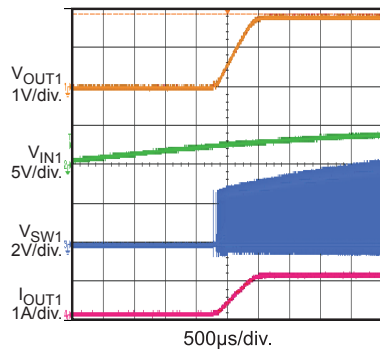
**VIN Power On without Load**

$I_{OUT1} = I_{OUT2} = 0A$



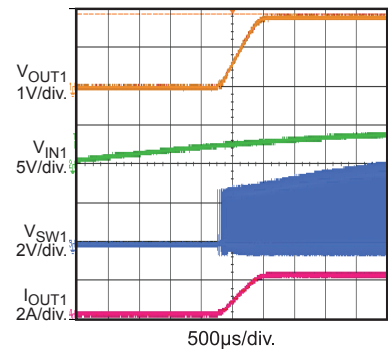
**VIN Power On with 1A Load**

$I_{OUT1} = 1A, I_{OUT2} = 0A$



**VIN Power On with 2A Load**

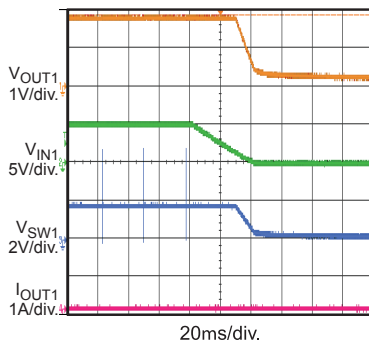
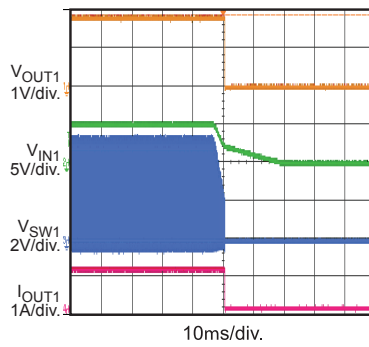
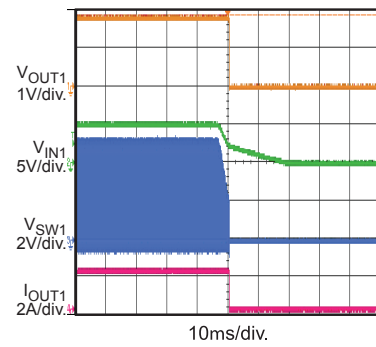
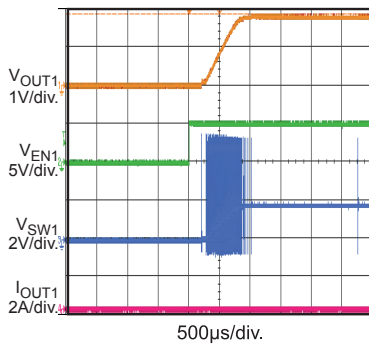
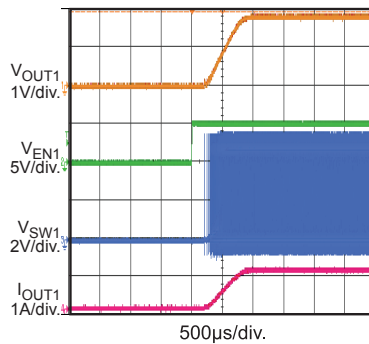
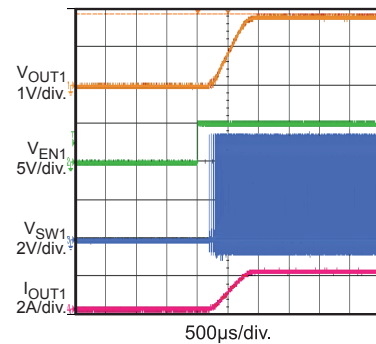
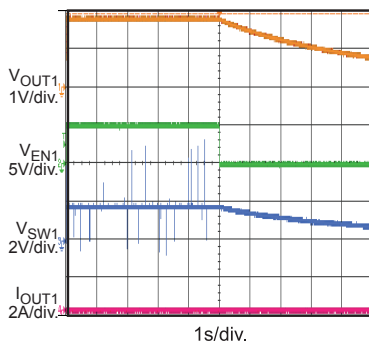
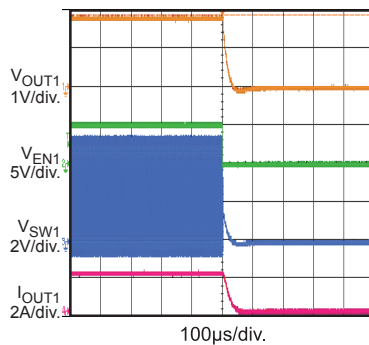
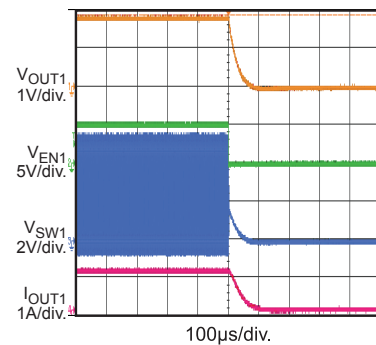
$I_{OUT1} = 2A, I_{OUT2} = 0A$



**EVB TEST RESULTS (continued)**

Performance waveforms are tested on the evaluation board.

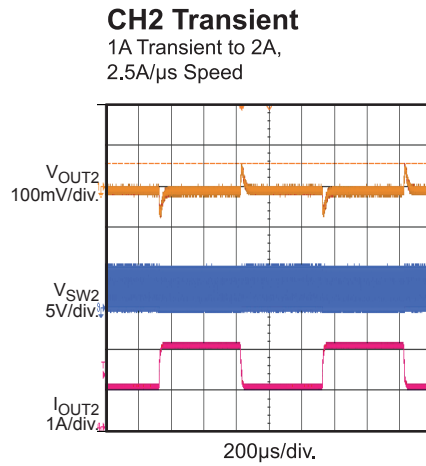
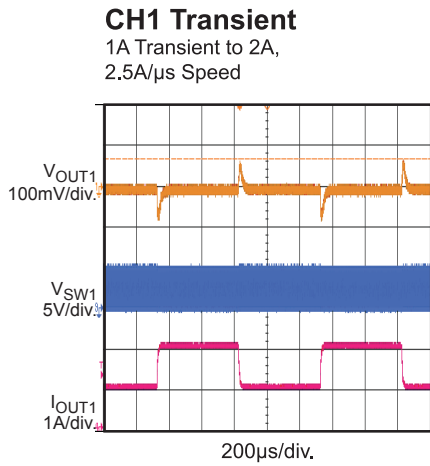
 $V_{IN} = 5V$ ,  $V_{OUT1} = 1.8V$ ,  $V_{OUT2} = 1.2V$ ,  $C_{OUT1} = C_{OUT2} = 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.

 **$V_{IN}$  Power Down  
without Load**
 $I_{OUT1} = I_{OUT2} = 0A$ 

 **$V_{IN}$  Power Down  
with 1A Load**
 $I_{OUT1} = 1A$ ,  $I_{OUT2} = 0A$ 

 **$V_{IN}$  Power Down  
with 2A Load**
 $I_{OUT1} = 2A$ ,  $I_{OUT2} = 0A$ 

**Enable On without Load**
 $I_{OUT1} = I_{OUT2} = 0A$ 

**Enable On with 1A Load**
 $I_{OUT1} = 1A$ ,  $I_{OUT2} = 0A$ 

**Enable On with 2A Load**
 $I_{OUT1} = 2A$ ,  $I_{OUT2} = 0A$ 

**Enable Down without Load**
 $I_{OUT1} = I_{OUT2} = 0A$ 

**Enable Down with 1A Load**
 $I_{OUT1} = 1A$ ,  $I_{OUT2} = 0A$ 

**Enable Down with 2A Load**
 $I_{OUT1} = 2A$ ,  $I_{OUT2} = 0A$ 


**EVB TEST RESULTS** *(continued)*

Performance waveforms are tested on the evaluation board.

$V_{IN} = 5V$ ,  $V_{OUT1} = 1.8V$ ,  $V_{OUT2} = 1.2V$ ,  $C_{OUT1} = C_{OUT2} = 22\mu F$ ,  $T_A = 25^\circ C$ , unless otherwise noted.



PRINTED CIRCUIT BOARD LAYOUT

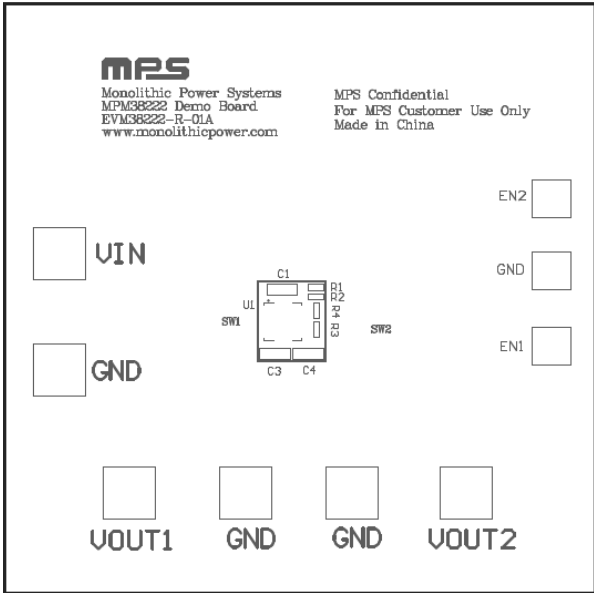


Figure 1: Top Silk Layer

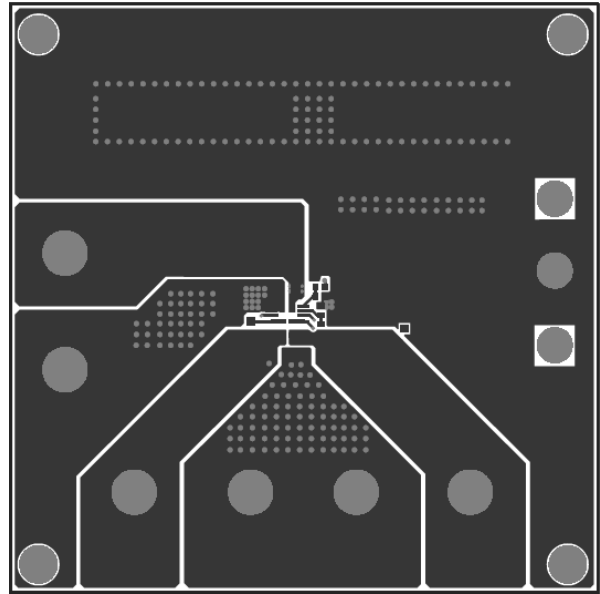


Figure 2: Top Layer

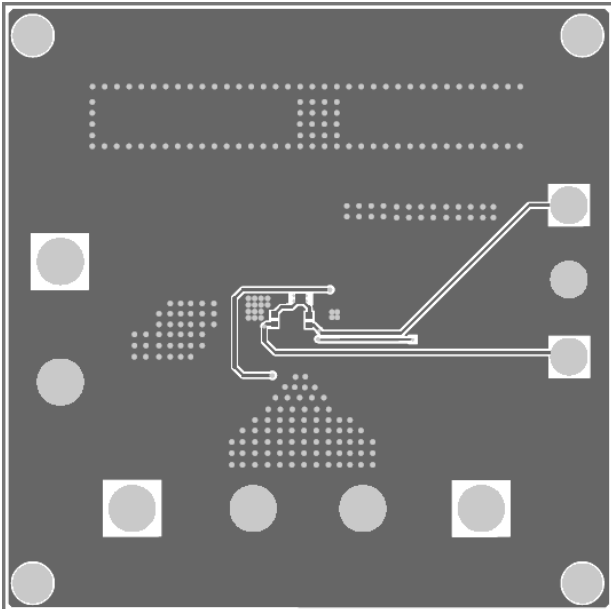


Figure 3: Bottom Layer

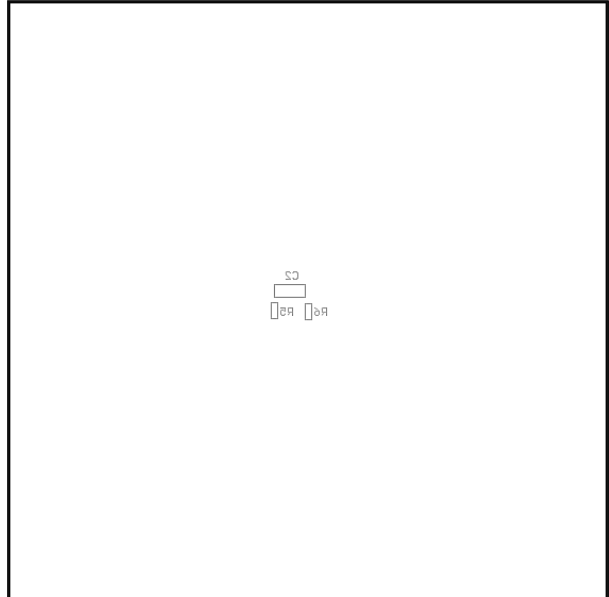


Figure 4: Bottom Silk Layer

## QUICK START GUIDE

The output voltage of this board is set externally by operating from +2.7V to +6V input. The default output voltage of this board is set to  $V_{OUT1}=1.8V$ ,  $V_{OUT2}=1.2V$ .

1. Preset Power Supply to  $2.7V \leq V_{IN} \leq 6V$ .
2. Turn Power Supply off.
3. Connect Power Supply terminals to:
  - a. Positive (+):  $V_{IN}$
  - b. Negative (-): GND
4. Connect Load to:
  - a. Positive (+):  $V_{OUT1}$
  - b. Negative (-): GND
  - c. Positive (+):  $V_{OUT2}$
  - d. Negative (-): GND
5. Turn Power Supply on after making connections.
6. To enable the MPM38222, apply a voltage,  $1.2V \leq V_{EN} \leq 6V$ , to the EN pin. To disable the MPM38222, apply a voltage,  $V_{EN} < 0.4V$ , to the EN pin. The EN pin can be connected to  $V_{IN}$  with a 100k $\Omega$  resistor for automatic startup.
7. The output voltage  $V_{OUT}$  can be changed by varying R1. Calculate the new value by formula:

$$R2 = \frac{R1}{\frac{V_{OUT}}{0.608V} - 1}$$

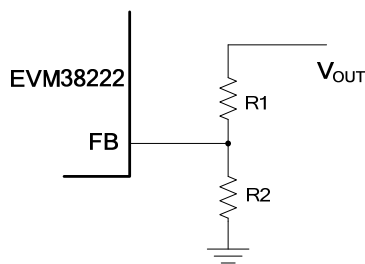


Figure 5

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